

A brief description of the present invention may be of assistance in addressing the patentability of the present invention in view of the pending §102 and §103 rejections.

The present invention provides a transparent thermoplastic resin composition which comprises a blend of a transparent aromatic thermoplastic resin and a copolyester of one aliphatic diol and two dicarboxylic acid moieties, e.g., the copolymer consists of a mixture of naphthylene dicarboxylic acid, another dicarboxylic acid and one aliphatic diol. The transparent aromatic thermoplastic resin component has a visible light transmittance of not less than 80% when the resin is molded into a 3 mm thick product.

Claims 1, 3-12, and 22 have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over JP 227 6856 or JP 915 7505.

The rejection is respectfully traversed.

As the references are understood, JP 227 6856 and JP 915 7505 are directed to resin blends which have a reduced aldehyde content and improved heat resistance. The disclosed resin blends are composed of a polyester resin and a polyester copolymer resin mixed together. Moreover, JP 227 6856 and JP 915 7505 teach the use of a polyethylene terephthalate (PET) as the polyester resin.

The Examiner states that "PET qualifies as a "transparent aromatic resin". Applicants respectfully disagree. As is well known in the art, PET is a crystalline polymer. Thin films of PET, e.g., PET films having a thickness of about 1 μm to about 500 μm are typically transparent. However, thicker PET films are less transparent as the formation of crystallites in the PET film reduced the transmittance of the PET film.

As seen from the partial translation (page 880, Table 15.2, right column) of "Saturated Polyester Resin Handbook" printed by "Nikkan Kogyo Shinbun-sha" (issued on Dec. 22, 1989), the transparency (ASTM D1746) of PET film having a thickness of 25.4 μm is 80% such that PET films of greater thickness, the lower transparency, and the PET plate having a thickness of 3 mm is opaque, that is, the transparency is less than 80%.

In contrast, the present invention provides a thermoplastic resin composition comprising a transparent aromatic thermoplastic resin and a copolyester, which is composed of naphthylene dicarboxylic acid, another dicarboxylic acid moiety, and one aliphatic diol moiety, such that a 3 mm thick film of the thermoplastic resin composition transmits at least 80% of visible light.

A PET plate having a thickness of 3 mm is opaque, e.g., such a PET plate transmits significantly less than 80% of the incident visible light. Clearly a PET resin does not satisfy the requirements of the present invention as a transparent aromatic thermoplastic resin and PET is not suitable for use as the transparent aromatic thermoplastic resin component of the thermoplastic resin compositions of the present invention.

The object of two JP references is to reduce the aldehyde content of PET resin compositions and to improve the heat resistance properties of the PET resin. Neither Japanese patent teaches or suggests transparent thermoplastic resins or improving the transparency of such aromatic thermoplastic resins by combining a transparent aromatic thermoplastic resin and a copolyester of one aliphatic diol and two dicarboxylic acid moieties.

Accordingly, claim 1 is patentable over the teachings of JP 227 6856 or JP 915 7505, or any combination thereof. Claims 3-26 depend from claim 1 and are therefore also patentable over the teachings of JP 227 6856 or JP 915 7505, or any combination thereof.

Claims 1-13, 20, 22, 23, and 25 were rejected under 35 U.S.C. §102(b) or 35 U.S.C. §102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Harada (U.S. Patent 5,804,267).

Claims 1-5 and 20-28 were rejected under 35 U.S.C. 103(a) as being unpatentable over Harada (U.S. Patent 5,804,267) in view of Allen (U.S. Patent 4,778,656) and Hirose (U.S. Patent (5,807,908).

Claims 1-19 and 21-28 were rejected under 35 U.S.C. 103(a) as being unpatentable over Harada (U.S. Patent 5,804,267) in view of Mizutani (U.S. Patent 5,118,726).

For the sake of brevity, the three § 102 and § 103 rejections are addressed in combination. Such a combined response is considered appropriate because *inter alia* each of the rejections relies on the Harada patent as the sole or primary citation. Each of the rejections is traversed.

As the reference is understood, Harada teaches polymer resin blends having a solubility parameter of 10.8 to 11.9 and consisting essentially of copolyester resin and a polycarbonate resin. More particularly, the resin blends disclosed by Harada include copolyester resins having a general formula



wherein Ar represents 2,6-naphthalene group or phenylene group, R represents a mixture of a 1,2-ethylene group and a 1,4-cyclohexylene group, and n is a number of 100 to 1000.

In Harada, the solubility parameter of polymer resin blend is defined as 10.8 to 11.9. Table 5 of Harada compares the solubility parameter and resin blend transparency to the copolymerization ratio of the copolyester resin composed of a mixture of two dicarboxylic acid moieties, i.e., naphthylene dicarboxylic acid (NDC) and terphthalic acid (TPA) and two aliphatic acid moieties, i.e., 1,4-(hydroxymethane)-cyclohexane (CHDM) and ethylene glycol (EG). As provided by the copolyester compositions presented in Table 5, only copolyester resins having NDC, TPA, CHDM, and EG moieties satisfy the claimed solubility range taught by Harada. In contrast, Comparative Example 6, which comprises only NDC as the dicarboxylic acid moiety and only EG as the aliphatic diol moiety, has a solubility parameter of 12.55, and Comparative Example 9, which comprises only TPA as the dicarboxylic acid moiety and EG as the aliphatic diol moiety, has a solubility parameter of 12.01. Thus, the solubility parameter of a copolyester having a mixture of NDC and TPA as the dicarboxylate moiety and only EG as the aliphatic diol moiety should have a solubility parameter of between 12.01 and 12.55 such that the thermoplastic resins of the present invention are not taught by Harada.

In contrast, the present invention provides a transparent thermoplastic resin composition comprising a resin component (b) which is a copolyester resin having as the dicarboxylic acid moiety a mixture of NDC and a phenylene dicarboxylic acid and having one aliphatic diol moiety such as EG. Articles molded from the transparent thermoplastic resin of the invention are transparent.

The present invention would not have been obvious to one skilled in the art based on the teaching of Harada. Moreover, the thermoplastic resin composition of the present invention having a copolyester component composed of NDC/TPA and EG which provides excellent transparency would not have been obvious from the resins disclosed in Harada in which a copolyester resin is provided that is transparent,

resistant to heat and hot water (resistant to whitening), and resistant to sterilization conditions at 85°C for 30 minutes (cold spot).

Harada neither discloses nor suggests that the polyester resins disclosed therein provide any chemical resistance other than resistance to whitening when exposed to hot water. In contrast the present invention provides thermoplastic resin compositions which are transparent and have excellent chemical resistance, in addition to heat resistance, and other like physical properties. The instant specification provides that chemical resistance is evaluated by comparing the breaking energy retention ratio and appearance (cloudy or swollen) by using of various organic chemicals, including polyethylene glycol, dioctyl phthalate (di(2-ethylhexyl) phthalate), tricresyl phosphate, ethyl nonyl ketone (3-decanone).

The present invention provides thermoplastic resins in which the ratio of (a) to the combined amount of (a) and (b) is 55 to 99.99% by weight, and the ratio of (b) is 0.01 to 45% by weight.

In contrast, Harada, does not teach preferred ranges of polycarbonate to copolyester ratios. Moreover, the ratio of copolyester to polycarbonate in the resins disclosed in the Examples of Harada range from 50/50 to 80/20, e.g., the weight content of the polycarbonate is greater than that of the polyester. Examples 80 and 82 appear to have more polyester by weight than polycarbonate but the physical properties including gas barrier property are poor such that one skilled in the art would not have been motivated from Harada to prepare polyester resins according to either Example 80 or 82. Harada teaches resin blends which are compositionally distinct from the thermoplastic resin compositions of the present invention and are suitable for different applications. Thus, one skilled in the art would not have been motivated to prepare resins having a polyester comprising only one aliphatic diol to form a transparent thermoplastic resin composition having excellent chemical resistance, including

polyethylene glycol, dioctyl phthalate, tricresyl phosphate, and ethyl nonyl ketone and excellent heat resistance based on the teachings of Harada.

The teachings of Allen, Hirose, and Mizutani, taken alone or in combination, fail to overcome the limitations of Harada.

As the references are understood, Hirose and Mizutani teach polycarbonate resins which include additives to improve the stability of the resin to exposure to ionizing radiation. Neither Hirose nor Mizutani teach thermoplastic resin compositions comprising a transparent thermoplastic resin and a polyester comprising one aliphatic diol and a mixture of naphthylene dicarboxylic acid and a second phenylene dicarboxylic acid.

As the reference is understood, Allen teaches resin compositions with improved stability to ionizing radiation by incorporating polyesters having phthalate-cyclohexandimethanol polyesters as radiation stabilizing additives.

Thus, the thermoplastic resin compositions of the present invention would not have been obvious to one skilled in the art based on Harada or any combination of Harada, with Allen, Hirose, and/or Mizutani. Accordingly Claim 1 is patentable over the teachings of Harada or any combination of Harada, with Allen, Hirose, and/or Mizutani. Claims 2-28 depend from claim 1 and are therefore also patentable over the teachings of Harada or any combination of Harada, with Allen, Hirose, and/or Mizutani.

Accordingly, claim 1 is patentable over the teachings of Harada, or any combination of Harada, Allen, Hirose, and Mizutani. Claims 2-28 depend from claim 1 and are therefore also patentable over the teachings over the teachings of Harada, or any combination of Harada, Allen, Hirose, and Mizutani.

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Although it is not believed that any additional fees are needed to consider this submission, the Examiner is hereby authorized to charge our deposit account no. 04-1105 should any fee be deemed necessary.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES TO CLAIMS

Please note that additions to the claims are shown underlined and deletions are shown in brackets.

IN THE SPECIFICATION:

Kindly amend the Title of the Invention, on page 1, as follows:

THERMOPLASTIC REIN COMPOSITION, MOLDED PRODUCT AND USE

Kindly amend the Cross Reference to Related Application, on page 1, as follows:

This is a continuation-in-part of application serial No. [(unknown)] (PCT/JP99/04007), filed July 27, 1999 (international filing date).

IN THE CLAIMS:

Please amend claim 1, as follows:

1. A thermoplastic resin composition comprising:
a transparent aromatic thermoplastic resin (a) and
a copolyester resin (b) comprising at least two kinds of dicarboxylic acid moieties and one kind of aliphatic diol moiety, 1 to 50 mol% of the dicarboxylic acid moieties being a naphthalenedicarboxylic acid moiety,
the ratio of (a) to the combined amount of (a) and (b) being 55 to 99.99% by weight, and the ratio of (b) being 0.01 to 45% by weight, and
said transparent aromatic thermoplastic resin (a) showing a visible light transmittance of not less than 80% when molded into a 3 mm thick product.